BRUT

SNOWMOBILE
SERVICE MANUAL

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LC 29 QUICK SERVICE CHART

Clutch Offset	1/2"
Center to Center of Clutch	Fixed 12 3/8 Nach 24 P.
Proper Belt	Brutanza Belt #13126-10 or #13126-14
Point Setting	.012" – .017"
Timing	3.5 mm or .138" B.T.D.C. MUST BE COMPLETED AT FULL SPARK ADVANCE
Plug Gap	.020
Carburetor Adjustment	High 1 turn Low 1-1/8 turn
Idle Speed	1500-2000 RPM
Spark Plug	Standard B7ES NGK Replacement N3 0r N3G Champion Hard running B8ES NGK or N2G Champion

BOLT TORQUE SPECI FICATIONS

NUT SIZE	TORQUE
5/8 Clutch	35 ft. lbs.
10 mm	60 in. lbs.
12 mm	18 ft. lbs.
14 mm	25 ft. lbs.
Flywheel	60 ft. lbs.

Ski Adjustment 1/4" toe out

Oil – use a B.I.A. endorsed oil with T.C.W. specs.
ST will so state on the can. Mix according to oil manufacturers directions.

Gas – Use a good grade of leaded fuel from a station that moves a lot of gas (gasoline that sets dormant can lose up to 50% of the octane in a 30 day period.)

THE NEW BRUT SNOWMOBILE
SET UP PROCEDURE

1. Uncrate the liquid cooled BRUT snowmobile. Be cautious that the upholstery is not torn or the finish on the cowl scratched.
2. Check all parts for shortages. If there should happen to be a shortage on some part, you must file a warranty claim within 10 days to receive credit for any parts which you use from your own stock.
3. Install springs in suspension, set suspension shock and install suspension in chassis.
4. Align track. Refer to Service Manual page ~~2~~ & ~~3~~ 31
5. Install skis and steering post and adjust toe out to ¼".
6. Check coolant level. This lever should be 1-1½" below the neck on surge tank.
7. Check chain case oil level and chain tension.
8. Check belt alignment. The offset should be ½".
9. Check brake and throttle cable for adjustment and operation. Adjust if necessary.
10. Inspect choke operation.
11. Install windshield.
12. Prepare to start engine. It is advisable to have a squirt bottle handy when starting a new engine. Remove drive belt, pour about one tablespoon of oil through the carburetor intake of each cylinder, pull the starter rope a couple of times to distribute oil in engine. Give engine a small amount of gas oil mixture from squirt bottle. Make sure kill button and ignition switch are on, pull choke out and pull through. If the engine does not start in one or two pulls, add a little more gas oil mix.
13. After engine starts, set the idle adjustment also the idle speed.
14. Run engine a few minutes at slow RPM to clear out excess fuel and oil. Shut engine off.
15. Install drive belt, raise rear of machine, check for clutch operation and track alignment.
16. Check high low beam on head light also tail and brake lights.
17. Set high speed adjustment on carburetor.
18. Machine should be cleaned up before delivery to customer.
19. Be sure warranty registration is filed within 10 days of date of sale. This is a Federal Law on all motorized vehicles. BRUTANZA ENGINEERING reserves the right to reject all warranty on machines not registered within proper time!
20. Steps 1 thru 19 should be repeated again after about 10 hours or 100 miles of driving.

A couple of hours well spent on pre-delivery and a check up can save you, the dealer, many hours of work and many dollars in the course of the winter. It will also make for a very good relationship with your customer.

TROUBLESHOOTING THE TWO STROKE ENGINE

Remember, any two stroke engine will run properly if three ingredients are combined in the correct sequence and proportion. They are:

FUEL	–	A mixture of gasoline and air.
COMPRESSION	–	In the crankcase to pump fuel.
	–	In the upper cylinder to make the fuel more combustile.
IGNITION	–	A correctly timed spark.

The following steps are listed in stages. The first stage gives you the simplest checks for each of the above. Succeeding stages become more involved and require more special tools.

STAGE I

A. SPARK PLUG CONDITION – Remove the plug, check the heat range, and examine the firing tip.

IF	THEN
The spark plug is dry	There is no fuel
	OR, the crankcase is completely flooded and fuel will not transfer.
The spark plug is wet	The spark plug is simply fouled or there is some other deficiency in the ignition system
	OR, there is flooding due to excessive fuel
	OR, the fuel/oil ratio is too rich.

B. FUEL AVAILABILITY – Remove the fuel line from the carburetor.

IF	THEN
Fuel will not flow to the carburetor	Check the: Tank vent Fuel pick up Fuel filter Fuel lines and fittings Primer pump

C. CYLINDER COMPRESSION – Place your finger tightly over the plug hole. Crank the engine.

IF	THEN
The pressure does not "pop" your finger off the hole	Go to STAGE II, COMPRESSION CHECK.

D. SPARK TEST – Connect the plug to its wire, rest plug shell against head; crank the engine.

IF	THEN
There is no spark or the spark "tracks" up the nose	Try the same test with a new plug.
No spark with new plug	Go on to STAGE II, ELECTRICAL.

STAGE II

A. SPARK PLUG CONDITION – Check the firing end for unusual deposits and conditions.

IF	THEN
The plug shows excessive heat: Blistered Nose Melted Electrodes Aluminum or lead "Beading" "Bridged" Electrodes	Check the carburetor for lean settings and if OK, go on to other checks for overheating.
The plug shows excessive carbon deposits	The carburetor settings may be too rich OR, the air supply to the carburetor may be choked OR, the exhaust system may be overly restrictive.

B. CYLINDER COMPRESSION – Use a conventional spark plug hole gauge. Crank the engine until the gauge will go no higher.

IF	THEN
The cylinder pressure is below 100 p.s.i.,	Remove the cylinder and examine the: Cylinder head Piston Piston rings Cylinder Check for proper tolerances.
The cylinder pressure is above 150 p.s.i.,	Check for unauthorized modification.

C. SPARK GAP TEST – Connect a spark gap tester – start the engine.

IF	THEN
The ignition system produces less than 7 mm of spark	Proceed with the next step.

D. IGNITION TIMING CHECK – Follow the normal ignition timing procedures using a dial gauge and point checker.

IF	THEN
You find loose or improper wire connections	Clean connections and reconnect properly.
The contact points do not open and close properly	Clean until they do.
When the points are physically open and you do not get a normal point checker resistance reading	The points may be "grounded" or "open" permanently (replace or repair). OR, the primary coil is open or the windings are not insulated (replace).

IF	THEN
The ignition timing is excessively advanced	The engine will run hot and maybe detonate (adjust as necessary).
The timing is excessively retarded	The engine will not produce normal horsepower (adjust as necessary).

E. STROBE LIGHT TEST – Start the engine with a strobe (timing) light connected and watch the marks provided on the flywheel and backing plate. Rev the engine slowly through the rpm range.

IF	THEN
A machine with centrifugal advance mechanism does not go to full advance	Performance will be poor. (Remove the flywheel and clean and lube the automatic advance.)
The strobe light indicates that the marks "stray" from alignment 1/4" or more OR there are random flashes in addition to normal ignition	Poor performance and overheating will result (note any obvious crankshaft deflection and go on to STAGE III, CRANKSHAFT DEFLECTION).

STAGE III

A. **CARBURETOR INSPECTION** – Remove, disassemble and inspect the carburetor.

IF	THEN
You find dirt or bits of metal	The carburetor will cause engine flooding (wash clean).
There is a flaw in either diaphragm or the check valve sheet	The carburetor may not deliver enough fuel and the engine will run hot or perhaps will not start at all (replace damaged parts).

IF	THEN
The fuel inlet valve (needle and seat) is damaged	The fuel will not be controlled and the engine will be flooded.
The mounting flange is warped	Air will leak into the intake port and cause a lean mixture (surface grind the flange).

B. **MUFFLER INSPECTION** – Remove the muffler.

IF	THEN
It appears to be clogged with deposits	The engine will not produce normal horsepower and may overheat (clean out the muffler).
You can hear loose metal pieces or silencing material when you shake the muffler	The engine will not produce normal horsepower and may overheat (replace or repair the muffler).

C. **CRANKCASE PRESSURE CHECK** – Seal the intake and exhaust ports and connect a pressure checking device. Pressurize the engine to 10 p.s.i.

IF	THEN
The pressure leaks at a rate of 1/2 lb./min.	The air/fuel mixture will become lean enough to be noticed as a "hot" plug reading. The machine will suffer from short plug life.
The pressure leaks at a rate greater than 1 lb./min.	The air/fuel mixture may become lean enough to cause preignition, detonation, and perhaps melting of the piston crown.

D. CRANKSHAFT DEFLECTION CHECK

Remove the primary drive unit and the magneto from the ends of the crankshaft. With a magnetic stand, mount the dial gauge and check the deflection on each end.

NOTE: Crankshaft deflection can be either bearing freeplay (the end will move up and down without rotating the crankshaft) or crankshaft misalignment (the end will "wobble" as it is turned).

IF	THEN
Deflection is greater than recommended tolerance	The crankshaft seals can be stretched to the point that an air leak will occur (this will not be detected by a static pressure test). The engine will overheat due to lean mixture. AND/OR, the ignition contact points can be opened at the improper time. This will cause overheating and poor performance. In either case, major engine work is necessary.

E. IGNITION COMPONENT CHECKS – Use appropriate instruments to test the:

Condenser Capacity
Condenser Insulation
Secondary Coil Resistance
Spark Plug Cap Resistance

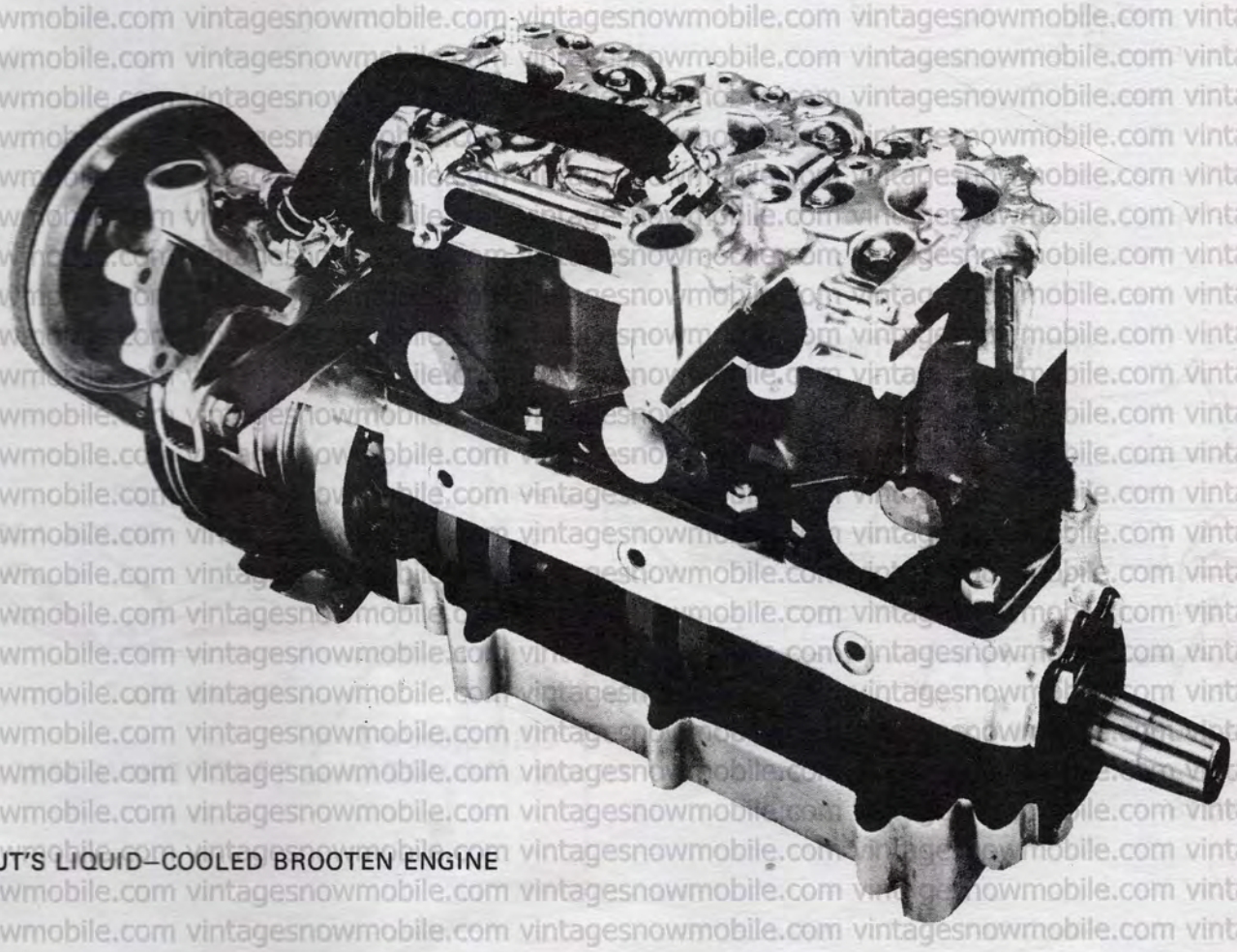
IF	THEN
Discrepancies are noted	There will be starting, plug fouling, and performance problems caused by weak spark (or no spark). (Replace components as necessary).

DRIVE BELT PREVENTIVE MAINTENANCE

	Symptoms	Cause	Treatment
1.	**Uneven belt wear on one side only**	a. Pulley misalignment	a. Align pulleys
		b. Loose engine mount(s)	b. Replace or tighten engine mount
		c. Rough or scratched pulley surface	c. Grind or polish pulley(s)
2.	**Belt glazed excessively or has baked appearance**	Excessive slippage caused by:	
		a. Insufficient pressure on belt sides	a. Check driver pulley for smooth actuation
		b. Excessive horsepower for belt and converter	b. Consult dealer
		c. Excessive oil on pulley surfaces	c. Check bearing seals and clean pulley surfaces
		d. Insufficient pre-load on driven spring	d. Consult Operator's Manual
		e. Excessive operation in low gear position	e. Inspect converter
3.	**Belt worn excessively in top width**	a. Excessive slippage	a. Check driver pulley for smooth actuation
		b. Rough or scratched pulley surface	b. Grind or polish pulley(s)
		c. Improper belt angle	c. Consult dealer
		d. Considerable use, belt wearing out	d. Replace belt
4.	**Belt worn narrow in one section**	Excessive slippage in driver pulley caused by:	
		a. Locked track	a. Rotate track by hand until free
		b. Converter not functioning properly	b. Repair or replace converter
		c. Engine idle speed too high	c. Reduce engine RPM
5.	**Belt too tight during engine idle**	a. Idle speed too high	a. Reduce engine RPM
		b. Incorrect belt or belt length	b. See Operator's Manual
		c. Incorrect drive center distance	c. See Operator's Manual and reduce center distance
		d. Idler bearing seized	d. Replace bearing

6.	Concave worn belt side(s)	a. Excessive ride-out on driver pulley	a. Repair or replace driver pulley
		b. Drive misalignment	b. Align pulleys
		c. Rough or scratched pulley(s) surface	c. Grind or polish pulleys
		d. Excessive slippage	d. Repair or replace driver pulley
7.	Belt disintegration	a. Excessive belt speed	a. Reduce engine RPM at high speed
		b. Sheave misalignment causing belt flip-over	b. Align sheaves
		c. Excessive slippage causing heat build-up in belt	c. Inspect converter
		d. Excessive operation in low gear position	d. Inspect converter
8.	Belt "flip-over" at	a. Pulley misalignment	a. Align pulleys
		b. Excessive belt speed	b. Reduce engine RPM
		c. Excessive ride-out on driver pulley	c. Repair or replace driver pulley
		d. Incorrect belt length	d. See Operator's Manual
9.	Belt edge cord broken	a. Pulley misalignment	a. Align pulleys
		b. Improper belt installation	b. See Operator's Manual
		c. Engagement speed too high	c. Reduce engagement speed
10.	Flex cracks between cogs	a. Considerable use, belt wearing out	a. Replace belt
		b. Bent pulley(s) flange causing belt flutter	b. Repair or replace pulley
		c. Excessive operation in low gear position	c. Inspect converter
		d. Extremely low temperature	d. Warm up belt slowly
11.	Sheared cogs, compression section fractured or torn	a. Improper belt installation	a. See Operator's Manual
		b. Belt rubbing stationary object	b. Check drive components
		c. Idler bearing seized	c. Replace bearing
12.	Broken belt	a. Engagement RPM too high	a. Reduce engagement RPM
		b. Belt hanging up in bottom of driven pulley	b. Belt too short; replace
		c. Locked track	c. Rotate track by hand until free

1973 BRUT SNOWMOBILE



BRUT'S LIQUID–COOLED BROOTEN ENGINE

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BRUT SPECIFICATIONS

Fuel capacity	5 gallons (US)	Length	102"
Spark plug gap	.017 - .020	Height w/windshield	35-1/2"
Point gap (LC29 only)	.012 - .017	Width	33-3/4"
Engine models	294cc liquid-cooled Brooten twin-cylinder	Track width	15-1/2"
Engine models	439cc liquid-cooled Brooten three-cylinder	Approximate weight LC44	395 lbs. (dry)
		Approximate weight LC29	355 lbs. (dry)

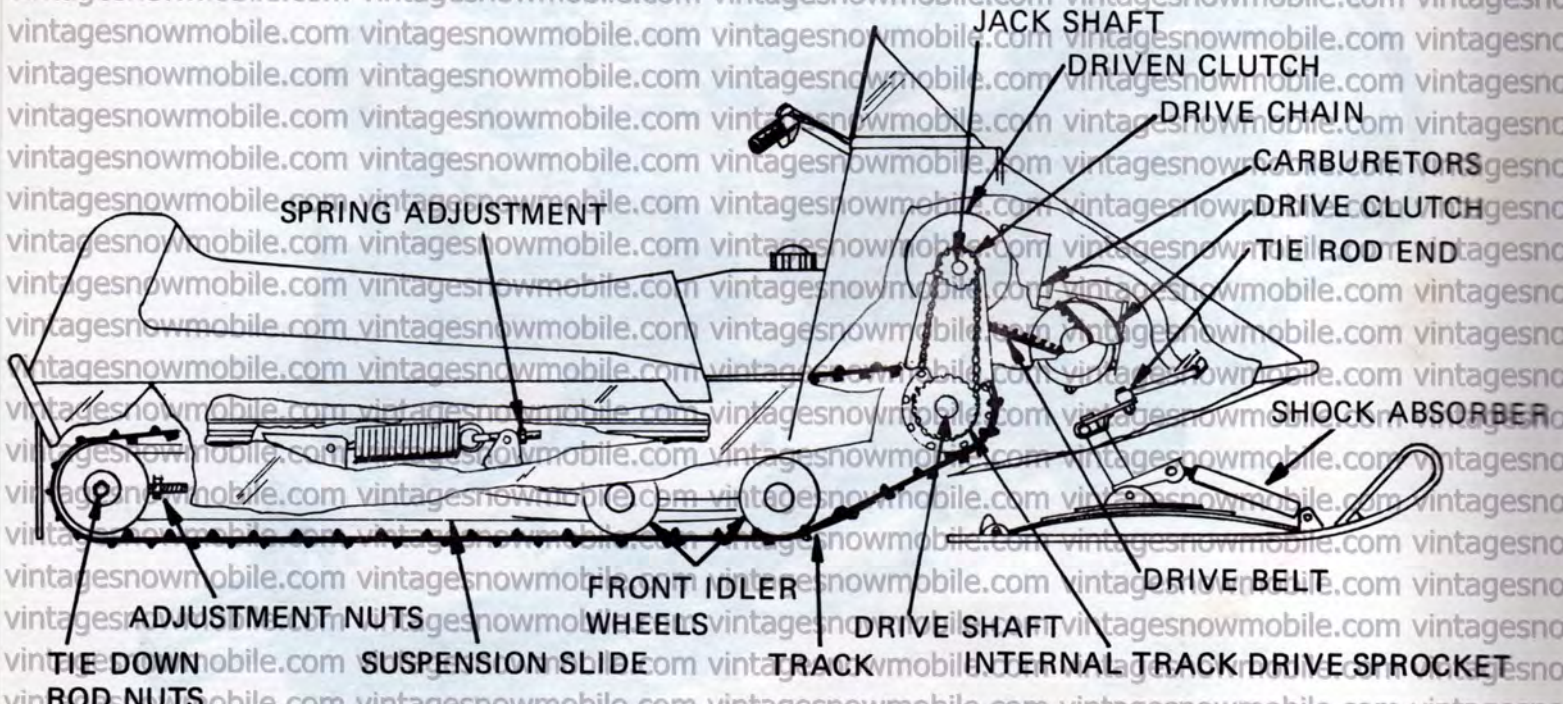
ENGINE TIMING: LC44 – 3.5mm BTDC fully-advanced
LC29 – 3.5mm BTDC fully-advanced
6mm fully-retarded

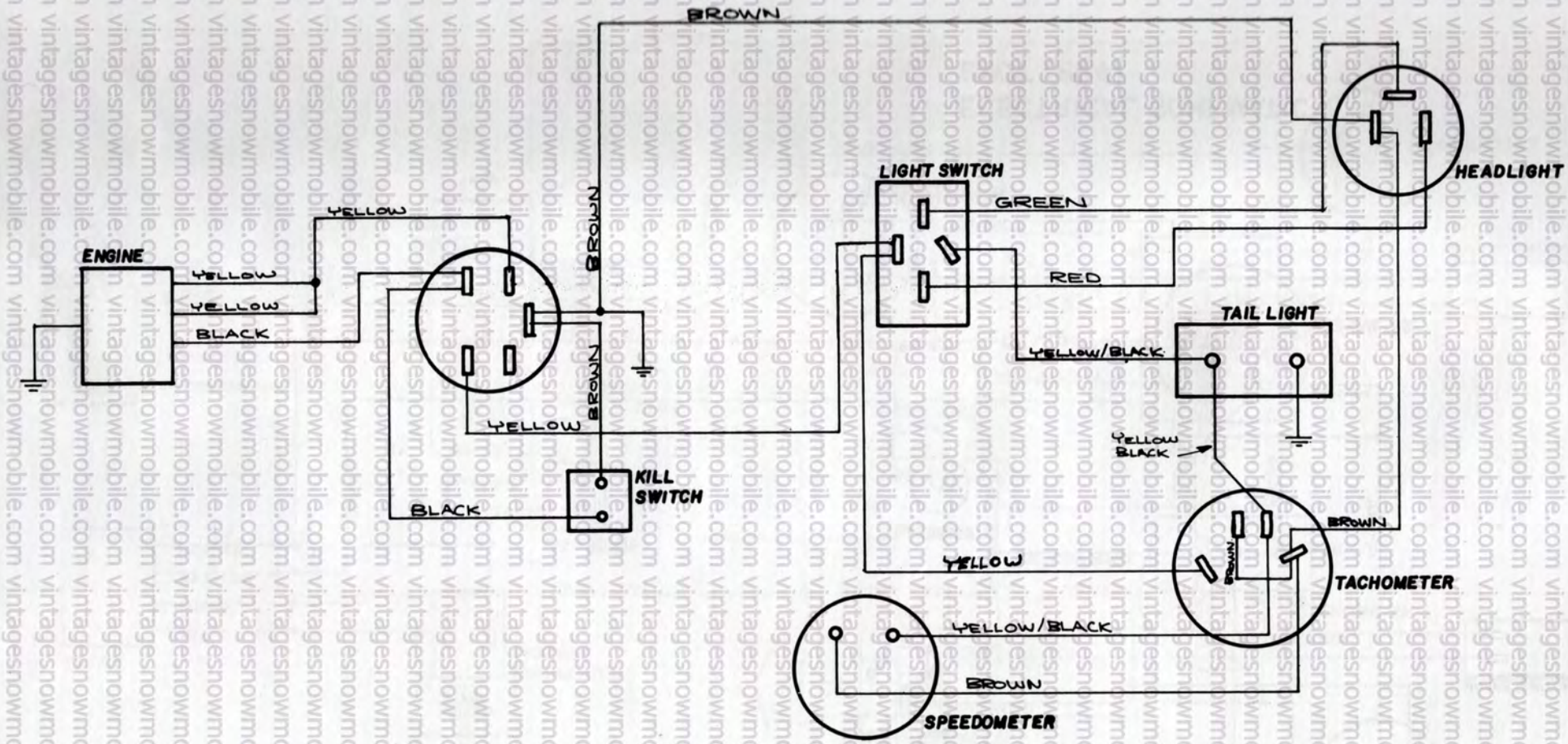
BRUT SERVICE TOOL LISTING:

Clutch puller, Part No. 23112-11 – Salsbury 23112-12 Brutanza
Clutch alignment tool, Part No. 23122-10 – Salsbury 23122-11 – Brutanza Drive
Flywheel puller, Part No. 23-12-10

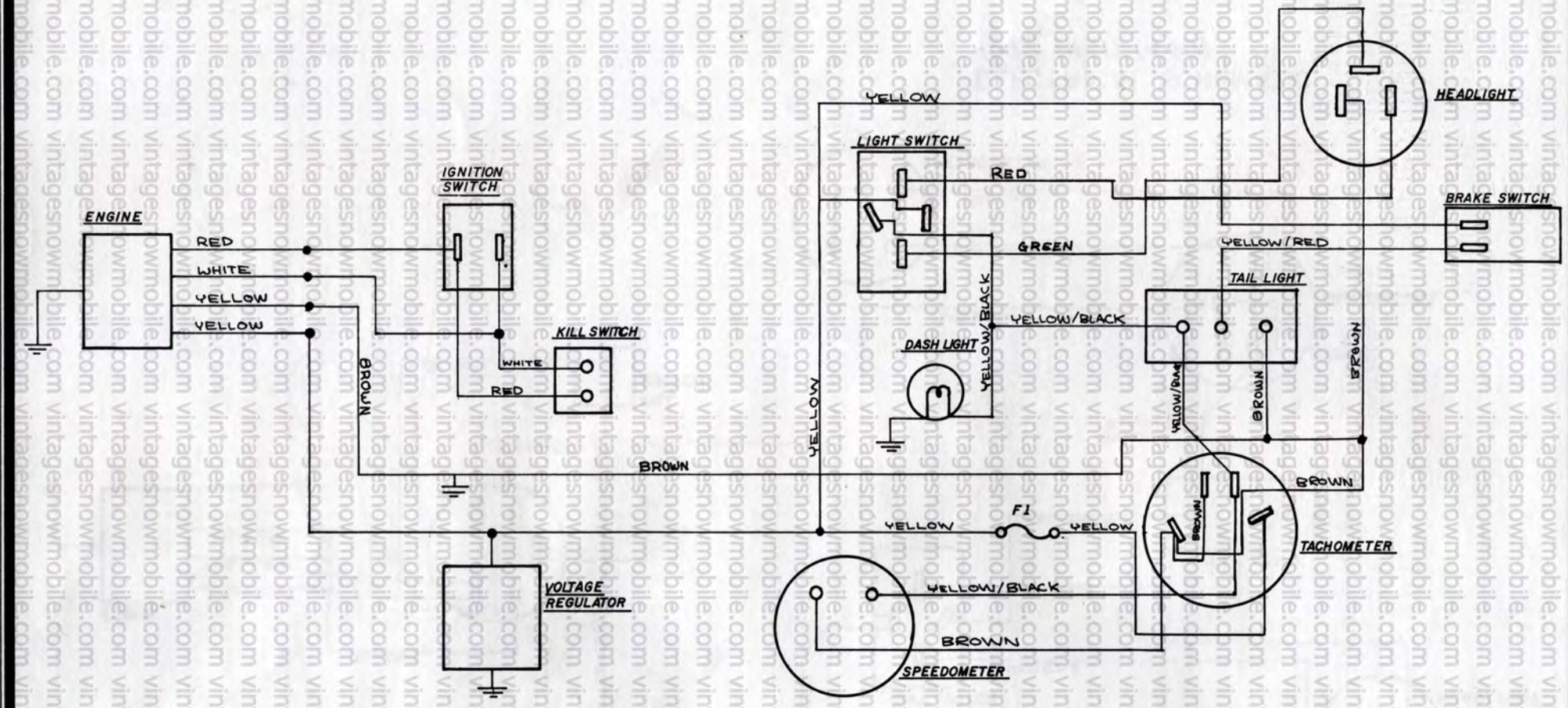
Recommended Spark Plug NGK-B7ES or Champion N3 or N3G

BRUT SNOWMOBILE CUTAWAY

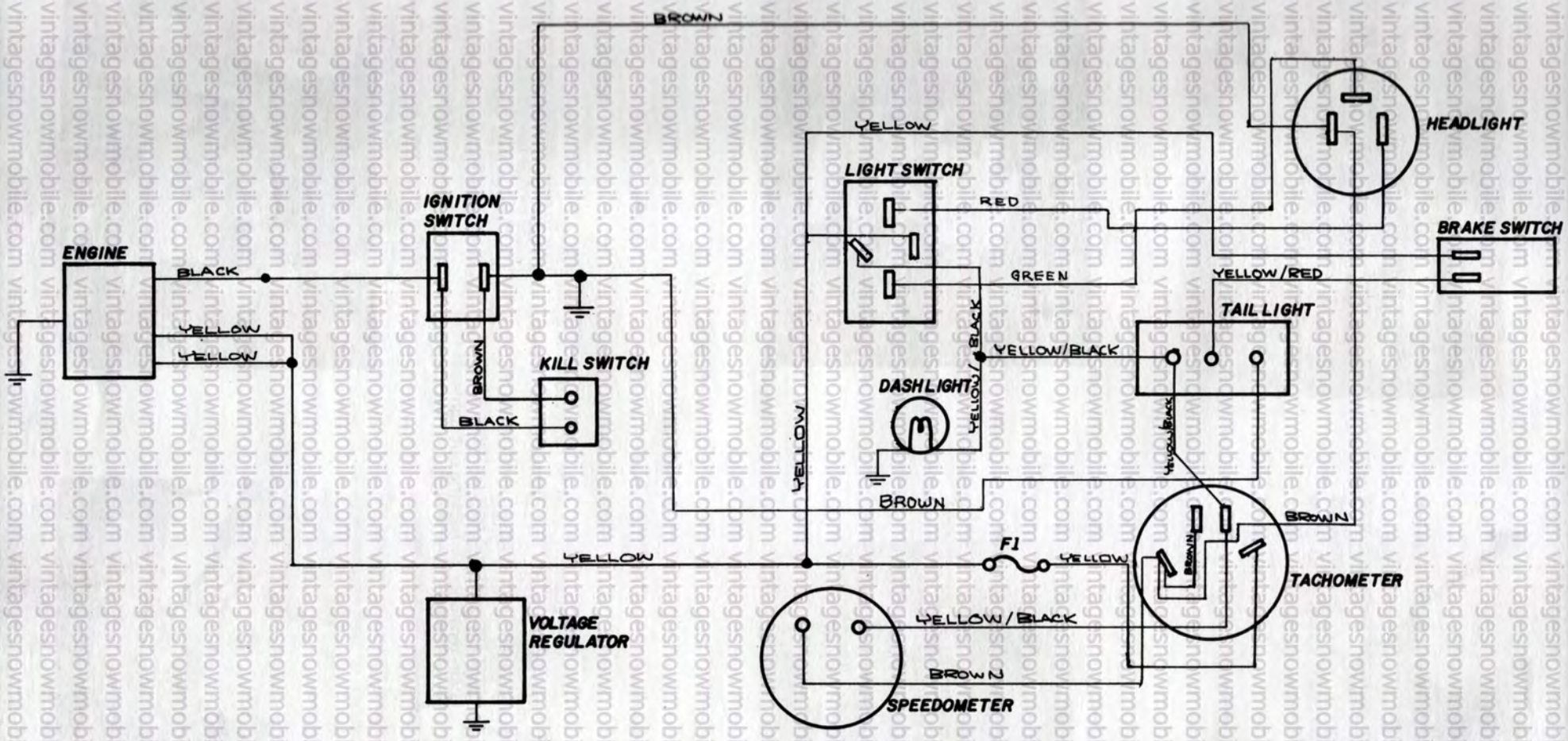




ELECTRICAL SCHEMATIC
1972 BRUT (440)



ELECTRICAL SCHEMATIC
BRUT (294)



ELECTRICAL SCHEMATIC

1973 BRUT (440)

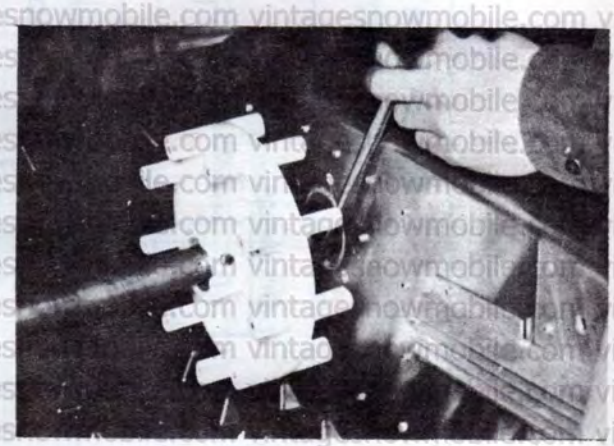
1974 BRUT (502)

SUSPENSION

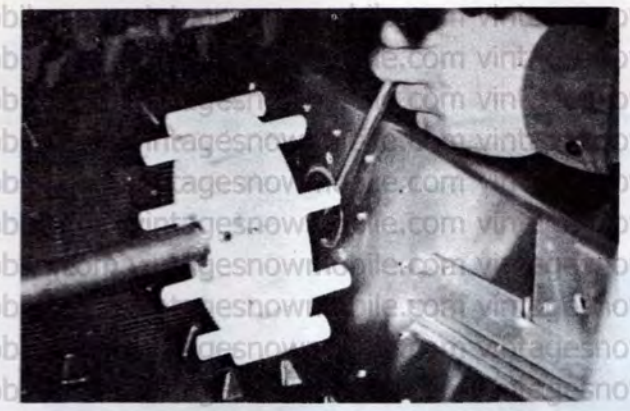
Remove suspension. To remove suspension remove the four (4) 3/8" locking bolts mounting suspension to chassis. Plug air bleed hole in gas cap, turn machine on to one side. Then pull out suspension. 1974 also has locks on front suspension lock bolts.

DRIVE SHAFT REMOVAL

To remove drive shaft, the chain case must be removed and the suspension must be removed. On the left side of the machine is a locking collar positioned on the spherical bearing in the flangette. (Photo at right) Loosen allen screw, turn collar opposite way it was installed. Note punch mark in locking hole. Slide collar over shaft, then push shaft into chain case hole and pull out bottom.



Chaincase assembly must be removed before drive shaft can be removed. (Two photos below) Remove chain case drive elements. Remove chain by removing snap ring on upper sprocket and bolt on lower sprocket. Remove chain tensioner by backing out tightener bolt.



INTERNAL DRIVE SPROCKET REMOVAL

With drive shaft removed, remove the track drive sprocket. With long 1/4" punch, pound out 5/16" roll pin from shaft. Drive sprocket should slide off.

CLUTCH REMOVAL

Remove three (3) Phillips head screws holding bumper and hood extrusion onto nosepan on left side of machine only.* Remove 7/16" clutch bolt, then large nut on clutch. Thread clutch puller into threads of large clutch nut. Bearing on end of puller will press against end of crankshaft and pull clutch, by tightening puller against crankshaft.

*This is not necessary on models equipped with Brutanza Drive Clutch.

DRIVE INSTALLATION

Lock collar must be on flangette side of shaft with eccentric portion facing tunnel before installation. Before installing chaincase, be sure snap ring is on shaft. With machine lying on left side, fit track into tunnel. Then push driveshaft into chaincase hole and back through spherical bearing mounted on the flangette. Holding drive sprockets as close to center of tunnel as possible slide chaincase onto drive shaft. Snug chaincase tightly up against tunnel. Slide top sprocket spacer over spline and install sprockets and chain. Screw bolt in driveshaft to hold chain sprocket on and center track drive sprockets.

Slip snap ring on top drive sprocket in chaincase to hold it in position. Install chain tightener assembly and tighten chain so there is 1/2" deflection in chain. Jam locking nut on tightener bolt. Check "O" ring seal on chaincase cover and install if O.K. Be careful not to damage jackshaft seal when installing chaincase cover.

Go back to driveshaft inside tunnel and slide lock collar into position next to flangette bearing. Turn collar lock with punch and tighten with socket wrench.

BRAKE INSTALLATION

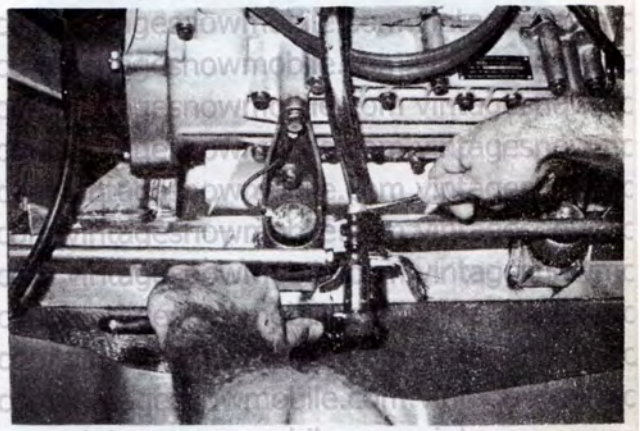
Place inner brake puck in chaincase cover. Install brake disc, then brake assembly. Make sure round end of actuating pin is toward actuating lever. Adjust brake so brake lights operates when brake is applied.

SUSPENSION INSTALLATION

With track and driveshaft installed, you can now install suspension. Raise machine rear approximately 30" off ground on secure stand. Slide suspension into track. Line up front two (2) mounting bolts, insert and tighten. Slide a 2"x2" or 2"x4" block under track, positioned just behind second set of front idler wheels. Drop rear of machine down. Push down or up on machine rear while holding rear suspension mounting shaft until shaft is in line to insert mounting bolts. Tighten bolts and align suspension. (See page 23 for track adjustment and alignment.)

ENGINE REMOVAL

Loosen linkage swivel screws on choke and throttle on the carb next to the coolant pump. Remove choke cable from choke cable bracket. Remove throttle cable at throttle lever next to handle grip.



Remove 3/8" nut holding tie rod ends to steering post frog. (Note: On assembly, place right hand tie rod end below steering frog and left hand tie rod end on top of steering frog.)

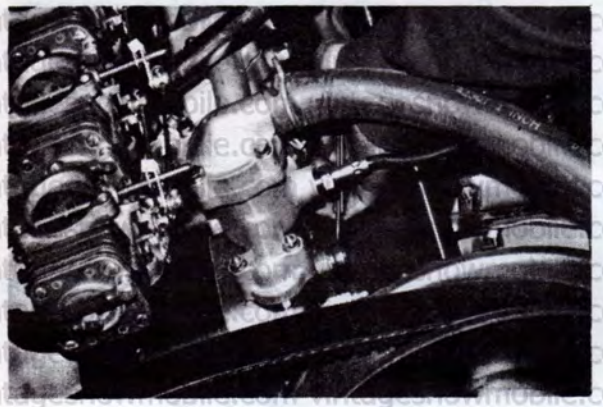
Remove cotter key at base of steering post.

Remove two (2) 1/4" nuts at upper steering bracket. Lift steering post away from engine compartment.

Disconnect CDI unit lead to engine. Disconnect the two (2) yellow lighting wires and black ground wire leading from stator unit. Disconnect spark plug leads.

Disconnect temperature gauge line from engine and plug manifold with small cork. Remove coolant hoses and plug with corks so coolant does not spill.

Remove 7/16" lock nuts holding front motor mounts to chassis.



Remove the six (6) 8mm bolts on rear pair of motor mounts. Lift engine and drain coolant. Be careful not to break the plugs or drop engine during removal.

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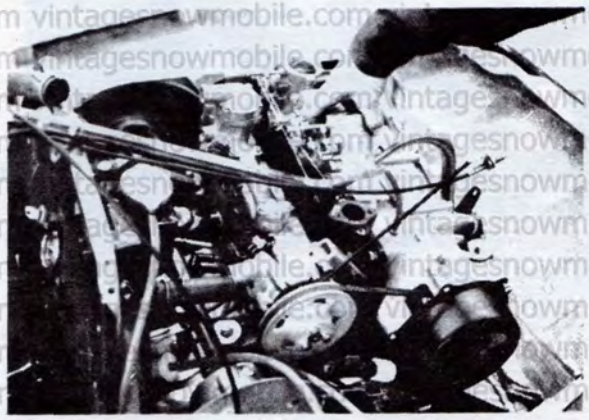
ENGINE DISASSEMBLY

Remove the 1/2" carb nuts.

Next remove the 8mm exhaust manifold nuts and 8mm bolts in crankcase holding on the muffler. Remove 6mm nuts holding both coolant manifolds in place, then remove manifold after disconnecting coolant bypass hose.



Remove the three (3) 8mm bolts holding water pump mounting brackets to end cylinder, then remove water pump and brackets. Remove motor mounts on top and bottom of engine.

Remove 8mm head nuts, then remove heads while carefully prying up gaskets with table knife or similar tool.

Remove 10mm cylinder nuts and slide cylinders off pistons. With snap ring pliers remove piston pin snap ring. Remove piston pin being careful not to apply excessive side pressure to connecting rod.
Remove piston pin bearing and bearing spacers.

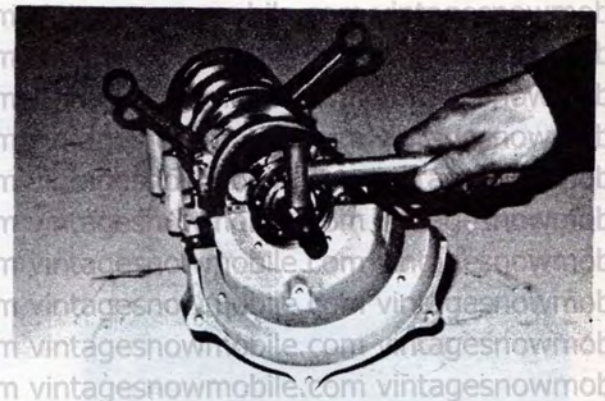
Remove 6mm recoil bolts and remove recoil. Remove 6mm pump pulley bolts. Remove 6mm dust cover bolts. Remove 18mm nut on rotor. Install puller and remove rotor.

Remove Phillips head seal screws on magneto side and remove seal. Bend lock tabs and remove seal plate on clutch end of crankshaft.

Now you can disassemble crankcase. Remove 18/12 remaining 8mm bolts and two (2) 10mm bolts. With plastic hammer, tap on one half of crankcase, holding the other half. When case separates shaft can be removed.

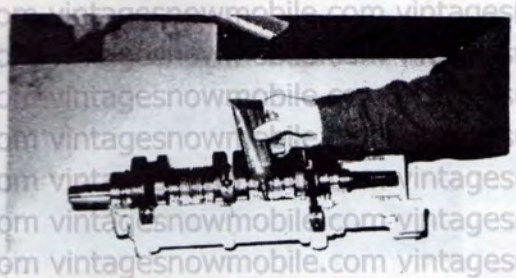
ENGINE ASSEMBLY

Lay crankcase lower half on workbench. Place crankshaft in crankcase. Install rotor key in crankcase being careful not to damage key.



Grease labyrinth seal and oil bearings.

Install spacer ring next to ball bearings on magneto side.



Apply gasket sealer on upper half of crankcase and fit onto lower half carefully.

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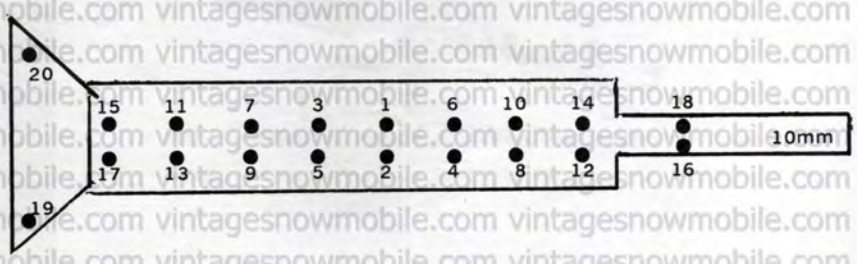
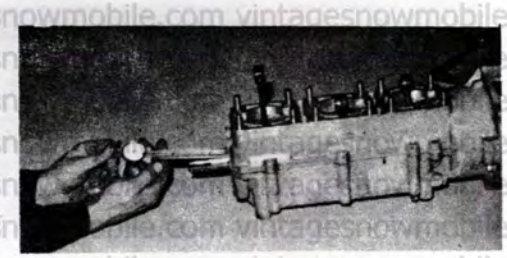
Tap clutch end of shaft with plastic hammer to position shaft correctly in case.

Install 18/12 8mm bolts and two (2) 10mm bolts and torque-tighten according to pattern in illustration below. Use same pattern for 294cc.



Torque 10mm bolts to 25 ft. lbs.
Torque 8mm bolts to 18 ft. lbs.

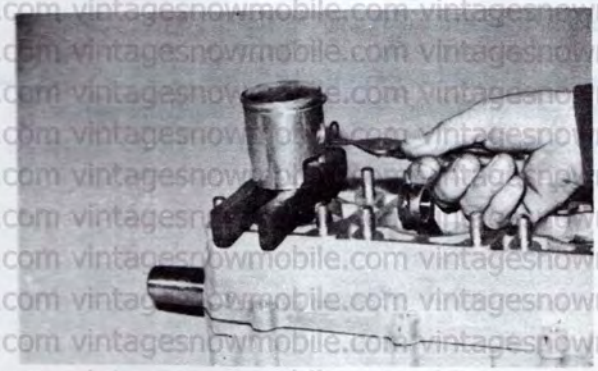
With depth micrometer, measure from seal plate mounting surface on case to outer race of shaft ball bearing.



Choose from three (3) thicknesses of gaskets to place under seal plate. If micrometer measures from .091 and up, use .2mm (.008"); if it measures from .081 to .091, use .3mm (.012); if it measures from .080 and down, use .5mm (.020"). Install correct gasket and seal plate, bend lock tabs over plate bolts.

Install cylinder base gasket.

Place piston pin bearing in connecting rod, then place piston pin spacers on ends of bearings, being careful not to drop them. Lubricate piston pin bearings.



Put one snap ring on each piston before installing on rod so you don't have to squeeze snap ring between two pistons.

Slip piston over connecting rod holding bearing and spacer in place. Slide piston pin through piston, bearing and spacers, then install remaining snap ring. On 1973 models with "L" ring pistons, the "L" ring locator pin must face intake port and on bottom ring the locator pin must be between exhaust and transfer port. On 1972 models with standard pistons, both locator pins must be between the transfer and the exhaust port.

Note: F on piston should point toward flywheel side of engine.

PISTON RING INSTALLATION

Expand ring until it just slips over piston. Do not expand any further than necessary to barely clear ring over piston. Be sure ring is correctly positioned so ring notch slides into ring locating pin correctly. With rings in place, set pistons aside.

After pistons have been installed, bolt on cylinders Position cylinders so intake port, or carb side, is toward side of crankcase with impulse fittings. Place wooden block under piston so it sits solid on crankcase. With ring compressor over piston rings, slide cylinder onto piston.

Caution: Ring ends will catch in transfer ports so you must press them with your fingers. Do not force cylinders on! When rings do not catch, cylinder will slide on with little effort.

With cylinders in place, place inlet coolant manifold on cylinders and torque 6mm nuts to 60 inch lbs. Then tighten four (4) 10mm nuts securely on base of cylinder. Caution: Be sure coolant manifold is torqued in place first to properly align cylinders. Place heads on cylinders and install outlet coolant manifold on heads and torque 6mm manifold nuts to 60 inch lbs. Now torque 8mm head nuts to 17 ft. lbs. using the following pattern:

Grease and install seal on magneto side.

(LC29) Mount stator plate in center of slots.

(LC29) Coat breaker cam with thin coat of grease. Connect timing equipment, light, buzzer or ohm meter to white primary lead, adjust point gap to get correct timing. Point gap should be between .012 and .017.

Install stator with three (3) Phillips head screws after aligning stator with machined holes in crankcase. (Do not force stator in, it should slide in by hand snugly. Do not rotate stator, holes must line up!)

Key rotor on crankshaft. Torque 18mm nut to 55 ft. lbs.

Install dust cover next to rotor stator assembly with 6mm screws. On 1972 models, spacer ring must be in place before installing lower belt pulley. With ring in position, install pulley with 6mm screws. Slide "v" belt over pulley and install recoil and spacer ring (1972 only) on crankcase.

Slide outlet water pipe on manifold and torque 6mm nuts to 60 inch lbs.

With brackets mounted on water pump, slide belt over pump pulley and screw brackets onto cylinder with three (3) 8mm bolts. Tighten belt with tightener bracket until you reach 1/2" deflection in belt.

Install water inlet hose and bypass hose, and tighten clamps. Fit exhaust gasket on manifold and install muffler with 8mm nuts.

Install the two (2) carbs closest to clutch. Throttle bracket fits under carb nearest clutch. The 1/4" spacer fits center carb and carb closest to coolant pump.

Install two (2) front engine mounts with four (4) 10mm bolts.

Set engine in chassis and install six (6) 8mm bolts in the two (2) 7/16" bolts on front mounts. Set steering post in position and tighten all bolts. Install third carb next to coolant pump. Install throttle cable on cable bracket. Center bracket on threads using adjusting jam nuts. Slide linkage rods through choke swivels on the two (2) carbs colsest to magneto and loop linkage rod around carb closest to clutch. Replace swivel screw after looping linkage rod over swivel. Mount choke cable on choke cable bracket and tighten securely. Thread choke and throttle cables through linkage swivel and tighten swivel screw.

THROTTLE LINKAGE ADJUSTMENT

Loosen linkage swivel screws on the two carburetors closest to clutch. Squeezing the throttle, the linkage rod should move freely inside swivels without activating the throttle shafts on these two carbs.

Back out all carburetor idle speed screws away from carb throttle shaft stops. This will synchronize all butterflies in closed position. Grasp linkage rod and push it hard enough so first carb butterfly closes completely. The other two carbs should be closed also. When they are all closed, continue to hold down rod and tighten swivel screws securely. Move throttle lever to check synchronization of all throttle shafts. If synchronized, turn idle speed screws until they just touch shaft stops, then make an additional 3/4 turn on each screw. You must turn them more for proper idle but this should be done with engine running. To set correct idle speed of 1500 rpm, you must turn idle screws on all carburetors exactly the same amount.

CHOKE LINKAGE ADJUSTMENT

Make choke adjustments the same as throttle so choke butterflies are all closed when choke cable is pulled. Then, when choke is pushed in, butterflies should open all the way.

STEERING ADJUSTMENT AND SKI ALIGNMENT

Position handle bars so they face straight ahead. Adjust either ski so it is also facing straight ahead. Adjust ski by loosening jam nuts at both ends of tie rod as necessary to align one ski. If you cannot align one ski exactly, you may have to index steering arm at spindle. When handle bars and one ski are aligned,measure distance from one ski to other at points on front and rear ski spring saddles. There should be 1/4" toe out, that is, front of skis are spread 1/4" farther apart than rear. If you do not have correct toe out, loosen jam nuts on tie rod that has not been adjusted and turn whichever way necessary to get 1/4" toe out. When steering is adjusted, make sure all jam nuts and other nuts and bolts are tight.

ENGINE TIMING

LC44 – The LC440 engine is equipped with capacitor discharge ignition (CDI) and timing is set in the factory at 3.5mm BTDC. in fully advanced position. Timing cannot be adjusted on this system and should never change.

LC29 – The LC294 engine is equipped with breaker point magneto ignition system. Timing is factory set a 3.5mm BTDC in fully advanced position.

To set timing, disconnect red wire leading from ignition points to ignition coil on cylinder next to magneto. Connect one lead of an ohmmeter, timing light or timing buzzer on connector leading from points. Connect other lead to grounding surface on engine. Insert an indicator in spark plug hole nearest magneto.

Position stator plate in center of slots. (Note: It is best to set correct timing with stator in this position. But if timing cannot be adjusted to point gap specs, then position of stator must be changed.) Adjust point gap so points open when dial indicator reads 3.5mm or .138". The cam must be in full advance position.

Check point gap with feeler gauge and make sure point gap is within specs of .012" and .017". If not, stator plate must be adjusted accordingly to set proper specs.

When timing is correct on magneto cylinder, next set timing on cylinder next to clutch. Disconnect white lead to coil. Adjust timing by changing point gap only. If stator plate is moved, flywheel cylinder must be retimed.

SERVICING DRIVEN CLUTCH

Position removed clutch with fixed face down. Rotate moveable sheave approximately 35° clockwise and hold steady. Press ramp down to clear key and rotate so key holds ramp down. Remove snap ring, then remove ramp. Hold firmly to prevent sudden spring release. Clean and examine all parts. Replace if worn. Slide moveable face onto hub, replace key. Engage spring with anchor point in ramp and anchor point in moveable face. Rotate movable face 1/2 turn or 180° counter clockwise after spring tension is taken up. Push stationary ramp down on hub shaft and lock under key. Replace snap ring. Release stationary ramp to seat against snap ring.

SERVICING DRIVE CLUTCH

Disassemble drive clutch by removing large nut and installing clutch puller in clutch. Grab moveable face with cover assembly firmly with one hand and turn puller until clutch comes off. Holding moveable face of clutch in both hands and puller facing floor, tap puller against a firm object. It should separate from stationary hub. Remove puller and clutch will come apart.

Inspect clutch arms to make sure they are not sticking. Clean and examine all parts. Replace if worn.

SKAG REPLACEMENT

The skag is a wear rod attached to each ski bottom to aid in turning and prevent wear on actual ski blade. Check condition of skag wear often and replace skags when worn down near ski. To replace, remove nut holding skag in place. With a solid bar, bend skag outward until bolt is free from its ski hole. Place a 1" piece of wood between skag and ski blade, just behind front ski bolt. With hammer, tap on wooden block, forcing skag forward until back pops out of slot. With new skag, push front sloped end into front ski slot, with 1" wooden block positioned in front of rear skag bolt. While guiding rear of skag toward rear skag hole by hand, tap on wooden block to drive skag backwards. When skag bolts line up directly with holes, use pry bar to remove wooden block and skag will snap into place. Then replace lock nuts on skag bolts.

HEADLIGHT REPLACEMENT

To replace headlight, start by removing wiring plug on back of lens. With fingers, remove wire spring holding lens down. Install new lens by first positioning it, then reinsert wire spring and plug in electrical plug. Replace with dual element, 12-volt GE4454 bulb or equivalent.

HEADLIGHT ADJUSTMENT

Four headlight adjustment screws enable you to adjust the beam, up, down and to either side. Adjustments should be made for your particular driving condition. Caution: It is easy to overdrive your headlight at night. Always use common sense and a safe speed at night. Drive especially carefully on unfamiliar land.

TAILLIGHT BRAKE LIGHT REPLACEMENT

To replace taillight, first remove lens screws. Take off lens and replace bulb with a 12-volt 1034 bulb.

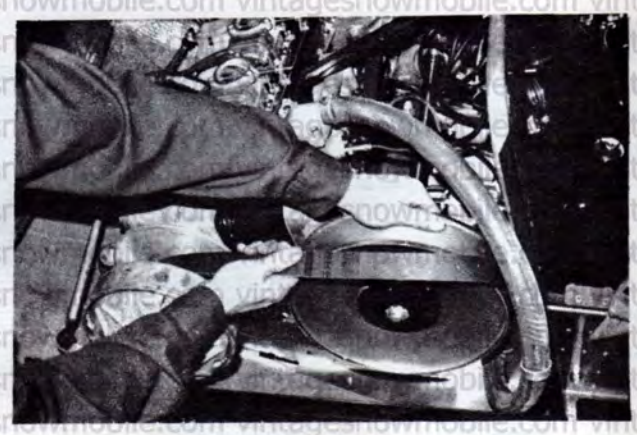
BRAKE ADJUSTMENT

Remove cotter pin on castellated nut (G, page 23) and tighten nut until puck presses against disc and there is about 3/4" brake handle play.

DRIVE BELT REPLACEMENT

Removal: Squeeze the brake so brake pressure will hold the stationary sheave of the driven clutch. Grab moveable sheave and rotate backwards, then pull belt down into driven clutch "V". Lift and slide belt off stationary sheave of driven clutch. When loose from driven unit, remove from drive clutch. Reminder – driven clutch should be pulled open completely.

Installation: Mount belt on drive clutch. Grab moveable face of driven clutch with both hands on opposite sides of rim diameter and turn moveable face backwards, then push to compress the clutch spring. With clutch completely open, push belt down between sheaves and slide belt over stationary sheave.



CLUTCH ALIGNMENT

Offset from drive to driven clutch is 5/16" with salsbury/salsbury and 1/2" with the salsbury/brutanza. Adjust by adding or subtracting washers on drive shaft under driven clutch. To adjust parallel positioning (alignment) of drive and driven clutches, loosen four (4) chaincase bolts and rotate chaincase in slots until clutches are parallel. Then recheck offset.

RIDE ADJUSTMENT

SPRING TENSION

Increasing or decreasing the spring tension by adjusting the eye bolt at the front of the spring will alter the firmness of the suspension. When adjusting spring tension, always have tension on friction shocks completely released. Shock adjustment will overcome severe machine bottoming. Adjust the eye bolt so that 1-1/2 - 2 inches of thread shows past the nut for a normal 175 lb. rider. Increase the amount of thread showing for a heavier person.

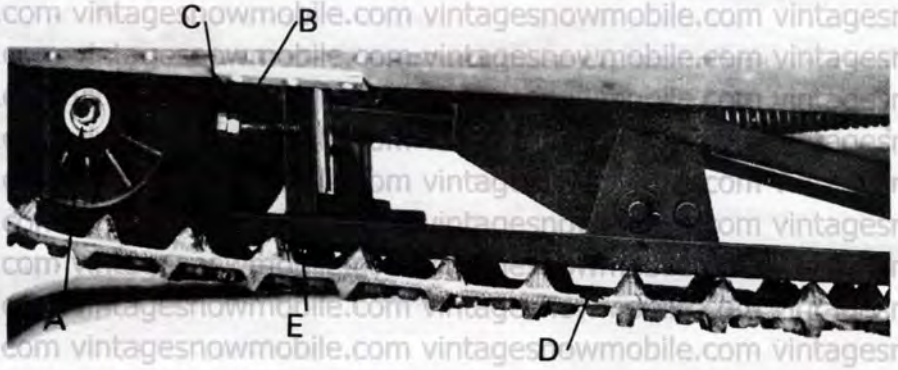
SHOCK TENSION

After adjusting spring tension to fit rider, adjust friction shocks by tightening castellated nut. Shocks should be adjusted so suspension will not bottom when severely jounced.

TRACK ADJUSTMENT AND ALIGNMENT

To work on track, lift rear of machine and set on secure stand, about 4" to 8" off the floor. To make track adjustments:

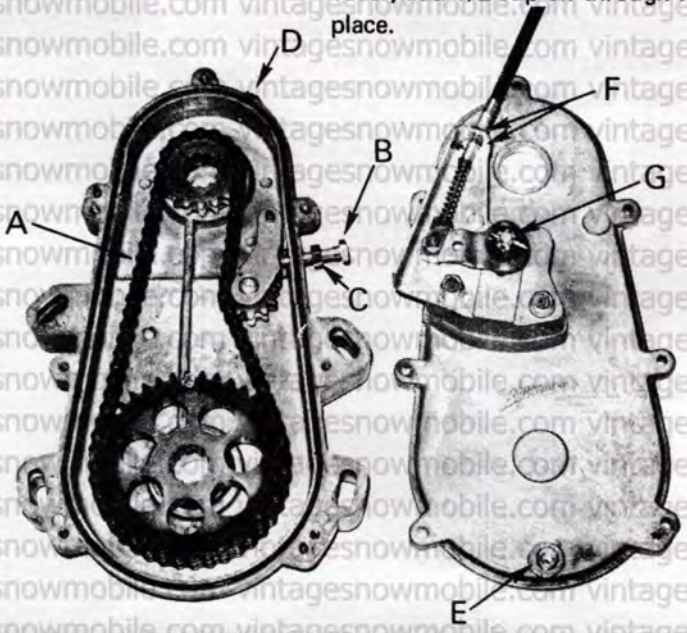
1. Loosen rear idler wheel tie down rod (A), allowing the idler wheels to turn freely as adjustments are being made.
2. Break lock nuts (B) away from adjustment nuts (C) on both sides of suspension, allowing you to move the idler shaft and wheels forward and back for adjustment.
3. Correct track drop is 1-1/2" away from the slide frame (D) to inside sliding part of track. Do not pull down on track to get this measurement and make sure that track is free of ice and snow or other weight. Correct tension and alignment should result in an even drop on both sides.
4. To check track alignment, start engine with machine on stand and turn track over slowly. (Caution – do not run track fast when checking alignment, and clear all tools away from track and suspension areas before starting engine.) After adjustments have been made, stop machine and shut off engine. Measure distance from rear of suspension upright (E) to rear of adjusting nut (C) on both sides. Measurements should be equal. If there is misalignment, side of track closest to tunnel must be tightened. If track is already very tight, then adjusting nut on track side farthest from tunnel must be loosened. Adjusting for drop and alignment, you should wind up with correct track tension and alignment. Track should be run after each adjustment to see if corrected. When track adjustment is correct, tighten rear idler tie-down rod, then tighten locking nut against adjusting nut on both sides of suspension, being careful not to move adjusting nut. After locking all nuts, start engine and check adjustment once more. On track drive lugs, periodically check point where lugs ride against rail. If one side shows more wear than the other, check track alignment.



DRIVE CHAIN ADJUSTMENT

A well-adjusted chain has 1/2" deflection (A) in travel between the two chain case sprockets. Chain tension is adjusted by tightener bolt (B). To adjust chain tension, loosen and back out lock nut (C). With an inch/lb. torque wrench, torque tightener bolt to 10 inch/lb., then back tightener bolt out 1/2 turn. Turn lock nut in and jam against chain case, being careful not to further tighten bolt.

When refitting chain case cover, replace lubricating oil. Add oil through filler plug (D), with check plug (E) removed. When oil level reaches check plug level, replace plug. On 1972 models, plug (E) is drain plug only. When refitting chaincase cover, add 1/2 cup oil through filler plug with drain plug in place.



COOLING SYSTEM

Your Brut snowmobile is equipped with an exclusive Brooten liquid-cooled, two-cycle engine. Your cooling system requires an Ethylene Glycol-based anti-freeze and comes from the factory mixed 50-50 with water. This mixture will protect to -47° F. Periodically check coolant with anti-freeze hydrometer.

To check coolant level, run machine enough to warm up. Coolant level should be approximately 1½" below top of tank. Also check system periodically for loose clamps.

LUBRICATION

Your Brut has two lubrication points. One is the chain case which has an oil bath reservoir for the drive chain. Maintain oil level with No. 10 weight nondetergent oil. To check correct oil level, make sure machine is on level surface. Loosen or remove check plug at bottom of chain case. If oil does not appear when removed, open filler plug at top of chain case and add oil until oil appears at check hole.

(For 1973 models only. See page 23, DRIVE CHAIN ADJUSTMENT, for 1972 model.)

There is a lube fitting on slide suspension frame near front idler wheel. Use only Brut Track Suspension Lubricant, which has a low melting point. This lubricant is not a substitute for no-snow conditions and does not permit your Brut to be run for distances without some moisture or snow for normal slide rail suspension lubrication. Brutanza has available an optional suspension wheel kit for marginal snow conditions.

FUEL MIXTURE

Your Brooten engine is a two-cycle, or two-stroke snowmobile engine which requires you to mix lubricating oil with the gasoline. The carburetor draws this gas/oil mixture into the crankcase for the engine to lubricate internal moving parts.

GASOLINE

Use a good grade of clean fresh gasoline. Don't use gasoline that has been stored in containers for a long time, since storage can result in a gum that can plug carburetor jets. plug carburetor jets.

OIL

Use a good grade of two-cycle engine oil, which states on the label that it is blended for snowmobiles. If your spark plugs are fouling a lot, there is a good chance that you are not using a good oil for your Brooten engine.

FUEL MIXING RATIO

Mix 20 parts of gasoline to 1 part of oil (a 20:1 ratio), which is 5 gallons of gas to 1 quart of oil. Too much oil will cause plug fouling, smoking and excessive carbon formation. Too little oil can cause engine overheating with resulting piston seizure or engine bearing failure.

MIXING INSTRUCTIONS

Never mix gasoline with oil in your snowmobile's fuel tank! Use a clean container. Fill it about half full of gas. Add oil and shake the mix well. Then add the remaining amount of gas to fill the container with mixed fuel. When refueling your snowmobile, use a funnel with a fine screen to prevent spilling and entry of dirt and water into the tank. Always reshake the fuel container if it's been sitting around for even a few hours to prevent oil from settling out of gasoline.

WARRANTY FILING INSTRUCTIONS

Warranty is not something a company gives out just to be good Joes. It is the only feed back we get to check on the machines in the field. We desperately need the cooperation of everyone on this matter to keep the BRUT updated and running properly.

In view of this, we are going to get tougher on the warranty program. We have been very lax in the past as to filing claims on time. This year the warranty claims must be filled out completely and turned in within 10 days of date of repair. If this rule is not complied with, you are taking a chance on getting the claim rejected. No claim has been rejected yet for this reason, however if it continues to be a problem, there will be no other choice but to do so.

GROUP CLAIMS

There will be times this year when we will use a group claim. On any group claim, there will be a bulletin issued with a group claim number. If there is no group claim number assigned, refer to samples. Use Regular Warranty Procedure for each unit.

BRUTANZA ENGINEERING, INC.

WARRANTY ALLOWANCE REQUEST

WARRANTY CLAIM 43481

Dealer Name

Address

1-18-74

1-10-74

294337

741000

LIST REPLACEMENT PARTS | DEALER LABOR ALLOWANCE | DEALER PARTS COST

QUANTITY | PART NO. | DESCRIPTION

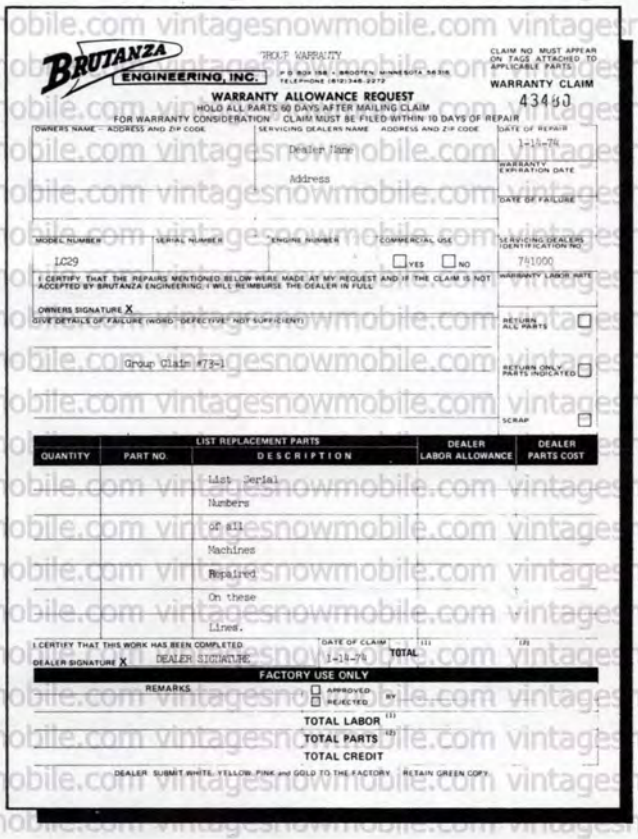
Idler wheel (front)

FACTORY USE ONLY

TOTAL LABOR

TOTAL PARTS

TOTAL CREDIT



BRUTANZA ENGINEERING, INC.

WARRANTY ALLOWANCE REQUEST

WARRANTY CLAIM 43480

Dealer Name

Address

1-18-74

LC29

741000

Group Claim #73-1

List Serial Numbers of all Machines Repaired On these Lines.

1-18-74

FACTORY USE ONLY

TOTAL LABOR

TOTAL PARTS

TOTAL CREDIT

Bonus Clutch Section W/502 Setup

DRIVE CLUTCH SET UP

LC29 Part #21300-13

1	21505-11	Weight
1	21518-10	Shoe
1	24704-12	5/64" X 5/16" Roll Pin
1	24200-20	1/4" X 20 UNC X 1/4" Pan Head Screw

Three (3) of each of above = Three grams each weight.

1	21510-10	Yellow 5 1/2 coil .175 wire spring 3 1/2" to 3 3/4" Length

LC44 Part #21300-14

1	21505-11	Weight
1	21518-10	Shoe
1	24704-12	5/64" X 5/16" Roll Pin
1	24200-21	1/4" X 20 UNC X 1/2" Pan Head Screw
3	24250-14	1/4" X .026 X 1/2" OD Flat Washer

Three (3) of each of above = 6 1/2 grams per weight

1	21510-11	Orange 5 coil .192 wire spring 3" to 3 1/4" Length

LC50 Part #21300-17

Same as LC44 with exception each weight to have four (4) 24250-14 1/4" X .026 X 1/2" OD Flat Washer. This will equal 7 grams per weight.

This clutch should be set to engage at 3800 to 4000 RPM and have a shift pattern of 7500 to 7700.

Higher Engagement will mean a higher RPM at the start of movement.

Lower engagement will mean lower RPM at the start of movement.

The length of spring mainly controls the engagement RPM. The size of wire and number of coils will determine the amount of weight you need to shift the clutch at a given RPM.

Note position of marks on cover and stationary before disassembling clutch. Note position of marks on moveable face and stationary face when cover is not yet assembled. This is the neutral position of the spring. When the cover is placed on the moveable face, note the position of the cover mark in relation to the moveable mark. Before compressing spring and installing assembly nut, rotate the clutch cover back and forth noting the approximately 1/2" free movement possible

Leave the cover in the counterclockwise position of this movement. This positions the ramp pads of the moveable against the helix ramps of the cover. At this point, note the mark on the cover and the mark on the stationary. These two marks must be in this position after the clutch is assembled. If an increase of approximately 100 shift RPM is desired, move the cover mark an additional 1/2" clockwise of the static point of the stationary mark. DO NOT EXCEED 1/2 INCH.

If a decrease of approximately 100 RPM is desired, move the cover mark an additional 1/2" counterclockwise of the static point of the stationary mark. DO NOT EXCEED 1/2 INCH. The size of spring wire and amount of coils will determine the amount of RPM you will lose or gain by rotating the cover a given distance.

UNDER NO CIRCUMSTANCES SHOULD ANY PRESSURE BE PUT ON THE SPRING BY ROTATING!

This could Cause:

1. Clutch to over Rev the Engine.
2. The shift RPM range to be thrown off.
3. The spring to bind on shaft not letting clutch shift into high gear.
4. The weight arms to hit ramp towers on moveable and prevent return to neutral.
5. The engine to over Rev to the point where considerable damage may result.

Washers Located On Pan Head Screws In Arms

The addition of one (1) washer on each arm will lower the shift range RPM by 50 - 200 RPM. Removal of one (1) washer will raise the shift range by 50 - 200 RPM. Varying the amount of washers will not change the engagement RPM.

Turning the cover counterclockwise will tend to eliminate the rattle encountered when starting and stopping, however it will lower shift RPM.

PLEASE TAKE NOTE OF DECAL ON CLUTCH. The main reason for this is to insure that the shoes on the arms stay in a proper position. The screws on the weight arm should be installed with locktite or punched in to insure they they do not come out.

Should your engine seize or lock up for any reason, the clutch should be dismantled for inspection of the shoes on the arms.

L44 8-10 Pull
24 13-5 11

L44 5 coil spring
1/3 Turn hook on square

DRIVEN CLUTCH ADJUSTMENT

To set up the Brutanza clutch on the LC 29 Brut it is necessary to set the driven clutch at 15# pull. This can be accomplished by using a 7 coil spring & wrapping it ½ turn. To measure the pull exactly follow the instructions below:

1. Remove drive belt
2. Remove drive (engine) clutch bolt
3. Install bolt between sheaves on driven clutch. Install the bolt so the sheaves can rotate on it. (be careful not to jam threads into shaft)
4. Using a small vise grip pliers. Clamp a 24" piece of wire on the outer lip of the driven clutch. (Clamp this on as close to the engine head as possible with wire pointing to the rear of machine.)
5. Bend a hook on the end of your piece of wire. (you will need to use a fish scale that reads to aprox. 20#.) Hook scale to wire.
6. Stand to the rear of the clutch. Pull on the scale to loosen up the moveable sheave. (move it approx. ½") Let off the pressure easy so you do not seat the moveable sheave to hard.
7. Grab the brake with one hand, the scale in the other hand and pull the scale slowly watching the scale reading. (take a reading when the sheave first moves) After it has moved from 3/8" to ½" let the pressure off the scale very slowly until the sheave starts to return to original position. Take your next reading when sheave starts to move. Do this several times noting the readings each time. You should get a reading on the pull of 18 - 19 lbs. and on the return a reading of 11.5 - 14 lbs. or an average of 1 pull and 1 release of 15lbs.